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ABSTRACT

The research reported here focuses on the beliefs, values and attitudes of one experienced biology teacher (Teacher A) in relation to the teaching of controversial biological issues. Of specific interest is the thinking behind what this teacher conceptualizes are the possibilities and problems for the teaching of controversial issues as part of her normal biology teaching practice given the constraints with which she works. This study was part of a larger project involving four experienced biology teachers, each conceptualized as expert practitioners, who worked independently with the writer on the development, implementation and reflection of lessons addressing one specific controversial issue. Interviews were conducted with participants before each lesson, all lessons were audiotaped and stimulated recall interviews were held after each lesson. Discussion of controversial issues, the nature of their controversy and the practicalities of biology lessons which addressed controversial issues were used as tools for accessing teachers' thinking in relation to classroom practice. Analysis of interviews and classroom discourse lead to the identification of four common propositional themes wherein were located specific propositions for each teacher. This paper details these themes, the propositions pertaining to Teacher A and identifies a set of variables within which this teacher works. (Author)

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Controversial biological issues: An exploratory tool for accessing teacher thinking in relation to classroom practice

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Abstract

The research reported here focuses on the beliefs, values and attitudes of one experienced biology teacher (Teacher A) in relation to the teaching of controversial biological issues. Of specific interest is the thinking behind what this teacher conceptualises are the possibilities and problems for the teaching of controversial issues as part of her normal biology teaching practice given the constraints with which she works. This study was part of a larger project[1] involving four experienced biology teachers, each conceptualised as expert practitioners, who worked independently with the writer on the development, implementation and reflection of lessons addressing one specific controversial issue. Interviews were conducted with participants before each lesson, all lessons was audiotaped and stimulated recall interviews were held after each lesson. Discussion of controversial issues, the nature of their controversy and the practicalities of biology lessons which addressed controversial issues were used as tools for accessing teachers' thinking in relation to classroom practice. Analysis of interviews and classroom discourse lead to the identification of four common propositional themes wherein were located specific propositions for each teacher. This paper details these themes, the propositions pertaining to Teacher A and identifies a set of variables within which this teacher works.

Introduction

Over the past three decades the science, technology and society (STS) movement has had as its central tenet that science and science education is *not* simply about the transmission of uncontested, value-neutral, scientific knowledge from those involved inside science (scientists) to those outside science (non scientists) or from teachers to students. Rather, the STS movement has raised an awareness, particularly in science education research and in curriculum development, that science itself is a social activity involving people and as such its knowledge is contestable and value-laden. In addition, science has social and technological implications for society. There is a voluminous body of extant literature which addresses these issues in terms of what teachers ought to do in science classrooms and what learning outcomes for students ought to be encouraged. Even though there is now a substantial body of research which examines science teachers' beliefs, there seem to be few empirically based studies which have as their focus the perspective of experienced biology teachers, how they view their teaching of biology and their use or otherwise of controversial issues as examples of an STS approach to science. The voice of these teachers has been somewhat neglected.

[1] Van Rooy, W. (1997).

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The Study

Given the tenets of the STS movements in recent years, the research endeavoured to come to an understanding of how a small group of experienced A-Level Biology teachers conceptualised their biology teaching practice. This could well have been done if the researcher had chosen simply to observe teachers as they went about their business of teaching and then had asked them to participate in a series of semi-structured interviews which would explore their decision making rationale for each lesson. However, what was also of interest to the researcher was the extent to which experienced A-Level Biology teachers, who it was hypothesised were familiar with the workings of the A-Level Biology syllabus[2], were able to engage with the possibilities and problems for the incorporation of controversial issues into their normal teaching. So the intention of the larger study was to develop a phenomenological understanding of A-Level Biology teaching from the perspective of a small group of experienced teachers within the context of controversial issues. Such teachers were regarded throughout the study as expert practitioners who delivered a course in biology from a government controlled syllabus board[3] to students. What is reported in this paper is how one teacher, Teacher A, viewed her biology teaching practice and that for the use of controversial issues.

The research strategy adopted was that of an intervention where the interaction between each participant and the researcher was collaborative and negotiated. Together each teacher and the researcher developed a series of lessons which addressed one controversial issue the teacher believed could be integrated with what they were doing in their A-Level Biology class at the time of the study. This necessitated the collection of data over an extended period of time (between six and eight weeks) during which discussions, in the form of semi-structured interviews, would take place. These interviews explored various aspects of each participants' A-level Biology teaching practice. For as Bryman and Burgess (1994) would indicate "crucial revelations are much more likely to emerge from chance incidents, extended comments, and both informal and formal gatherings" (p. 250). The purpose was neither to confront teachers about various aspects of their teaching, nor to judge the success or otherwise of controversial issues lessons or indeed other lessons. Instead the intention of the intervention was to provide windows of opportunity for teachers to articulate their normal A-Level Biology teaching practice to a person with no vested interest in either their school, students or the examination board associated with the A-Level Biology syllabus: a research and professional opportunity seldom available to them as professionals.

Data was collected in the form of semi-structured interviews with four teachers and lesson observation notes constructed by the researcher. All interviews were audiotaped and transcribed. There were four distinct sequential phases of data collection. The *pre-lesson interview phase*, of four weeks duration, asked teachers to describe what they did in classrooms and why. The aim of this phase was to encourage/allow teachers to explain their understanding of the syllabus and to provide them with opportunities to raise general views/concerns about biology teaching. In addition, this phase was used to develop a series of lessons on one specific pertinent controversial issue. It was during the development of these lessons that much of what each teacher had come to value about

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[2] In England A-Levels are a series of formal external examinations which are used by students to gain entry into university. A-Level Biology is one of the science disciplines students might select. Other subjects include Chemistry and English.

[3] In England there are several A-Level Examination Boards whose brief is to develop syllabi, prepare formal external examinations and assess students who present themselves for examination. At the time of this study, Teacher A was preparing her students for the A-Level Biology examination conducted by the Associated Examination Board (AEB).

themselves as successful teachers was revealed. The *controversial issues phase* provided the researcher with the opportunity to further explore A-Level Biology teaching practice but this time in a teaching and learning context often unfamiliar to both teachers and students. Of interest was not only the dialogue between teachers and their students, but also the interaction/dialogue between students themselves in these lessons (each of which was audio-taped). The *post-lesson phase* asked teachers to comment on each of the controversial issues lessons. These comments were revealing in terms of variations to teachers' routine lesson procedures. There were two sets of interviews in this phase - debriefing interviews held immediately after each lesson and interviews held some two weeks after the lessons. During these latter interviews the longer term impact of each lesson was sought. The final phase, *the proposition phase*, asked teachers to give critical comment on the veracity of an initial series of theoretical statements (termed propositions) devised by the researcher as a result of her fine grained analysis of all data and later on a draft account of their A-Level Biology teaching.

Since the purpose of the study was to develop a phenomenological understanding of experienced A-Level Biology teachers, data analysis sought to meet the three Schutzian postulates of logical consistency, subjective interpretation and adequacy through the creation of second-order constructs called propositions (Schutz, 1990) derived from the data. There were no *a priori* themes or propositional statements. Propositions were teacher-specific: those for Teacher A, the subject of this paper, are listed below. Propositions were the result of a detailed analysis procedure (Van Rooy, 1998) which made use of the constant comparative method of analysis/grounded theory (Glaser & Strauss, 1967) and the multi-stage data reduction approach (Miles & Huberman, 1994) whilst remaining ever mindful of possible contradictory views held by each participant (Hammersley & Atkinson, 1983 as cited in Bryman & Burgess, 1994).

Specific draft accounts for each participant were completed and forwarded to them for comment. The final report of the study was written as a series of linked accounts beginning with Teacher A, the first participant, and served to reflect commonalities and differences between teachers. What now follows is a brief description of each participant and a detailed account of Teacher A about what it means for her to be an A-Level Biology teacher.

The Participants

Four experienced practicing biology teachers participated in the study. All were currently working in comprehensive, coeducational government funded high schools in Oxfordshire (U.K.), had between 4 and 12 years of teaching experience and were preparing groups of senior secondary school students (16-18 year olds) for a final public examination in biology known as A-Level Biology.

Teacher A

Teacher A (A) had been teaching for 12 years and was the most experienced A-Level Biology teacher in the study. She had a first degree in biology and had been a staff member at her current school for seven years. Teacher A was thought to be competent by her Head of Department, able to produce excellent examination results and also was well thought of by her students. Teacher A believed that the school fostered high academic success for all students, evidence of which could be seen in examination results. The importance of academic success was paramount for this teacher and came to define her professional identity.

Teacher A had neither been approached nor been involved in any prior classroom-based research. She thought that participation in this study would give her the occasion to examine opportunities for using controversial issues as part of her A-Level Biology teaching without compromising her coverage of the syllabus. At the time of the study, A was involved in a unit of work dealing with the human circulatory system and thought that the issue of organ transplantation would fit with what she was teaching. For A personally, this issue *per se* was not controversial but she appreciated that for some of her students it might well be, particularly for some students of certain religious backgrounds or for those whose families had experienced such medical requests in the past.

Teacher B

Teacher B was the youngest participant with four years teaching experience. Before beginning her biology teaching she had been a research scientist. B had no regrets about her change in career. Teacher B appeared confident in all aspects of her biology teaching. She believed she had adequate background knowledge and understanding of all biological concepts located within the A-Level Biology syllabus. What characterised B's biology teaching was her belief that students could grasp the complexity of biology provided they were able to make the necessary links between its more basic concepts. Assisting her students to make these links was for Teacher B the essence of her A-Level Biology teaching.

Choice was something which Teacher B valued. If she was to become involved in the research she believed that her students ought to be given the opportunity to select a relevant and interesting controversial issue from a number of possible options. At the time she was engaging students in a unit of work dealing with cell structure and biochemistry coupled with an appreciation of some of the applied and technological aspects of biology. Of the two most popular issues nominated by her students, namely cloning and animal experimentation, B chose the latter because she believed this issue would sustain their interest. Class discussion of animal experimentation proved to be lively and well informed.

Teacher C

Prior to beginning teaching some seven years previous to the study, Teacher C was an industrial psychologist. She had been at her school for three years and perceived her teaching career in terms of diversification of roles - Head of Biology, mentor for beginning teachers and student year group coordinator.

The reason that Teacher C became involved in the research was that she believed it would provide her with a rare opportunity to explore, develop, implement and evaluate an alternative teaching approach to human reproduction which involved small group discussion and problem solving. For this purpose she chose human infertility and its associated medical technologies despite her stated concern that she lacked the necessary background knowledge. This was addressed by her before the proposed lessons.

Teacher D

Teacher D was the only participant with a doctorate. He had five years of teaching and enjoyed the experience. Like Teacher B, D appeared assured in many facets of his teaching. He believed that he was in possession of a broad, in-depth understanding of biology and felt confident in his ability to come to terms with less familiar syllabus content.

Unlike other participants, D engaged in the discussion of controversial issues on a routine and formal basis with his students, citing diabetes management, cloning and human embryo experimentation as examples. He believed that controversial issues brought to the forefront of students' minds some of the social and ethical aspects of biological/scientific research and for this reason controversial issues were of sufficient importance for them to be married with the demands of the syllabus and examinations.

Understanding the Teaching Perspective of Teacher A

This section of the paper outlines the perspective of the first participant, Teacher A, as she goes about her usual A-Level Biology teaching. It presents her perspective in terms of the four propositional themes which emerged from analysis of all interviews and lesson talk.

Propositional Theme 1: The A-Level Biology Teaching Context

Providing students with what Teacher A considered to be the best learning opportunities to gain high examination grades was for this teacher her prime professional goal. This she did by ensuring that what students learnt in her classes was under her immediate control and that the content of lessons was transmitted to them in an interesting manner. She believed she could contribute much to both teaching and learning. The following propositions encapsulate the essential elements of her biology teaching practice - professional/public concerns and personal/private concerns.

Professional/public concerns centred around the primary professional responsibility that of maximising the probability of examination success. In order to achieve this, given a content heavy, predetermined syllabus, there was a need to manage efficiently the available time to cover the syllabus.

Personal concerns centred around issues to do with A's subject matter knowledge, a desire to be 'in control' and a perceived deficit, from her perspective, in relation to the social skills needed to implement group work and classroom discussion.

Professional/public concerns for Teacher A centred around three interwoven concerns - examinations, syllabus and time - each of which dominated her thinking and were reflected in her overall approach to A-Level Biology teaching.

> Yes the three concerns are there as ever. The external exam and the syllabus are always going to be the way that you are going to have to operate. I think it is an objective system ... I agree there is not time for anything that would delay syllabus coverage. It really is a worry if you lose one lesson to catch that up.

It was the implication of this in terms of how Teacher A had come to view her A-Level Biology teaching, the potential impact on her of curriculum change and of any new/novel approaches to biology teaching which were of interest in understanding her rationale for what she did on a day to day basis. For her, any interesting research findings in biology or social impact of science, of which controversial issues might be one such example, if viewed by A to be outside the syllabus boundaries, were given peripheral status. By not giving such items more than a five minute chat, and by implication low status in terms of valuable knowledge and understanding of biology, A believed she was meeting her professional responsibilities in terms of providing students with sufficient time to cover the syllabus.

Examinations, syllabus and time shaped her teaching and could be seen in her talk about lesson planning and implementation and in her reasons why planned, formal, whole class discussions and small group work were not part of her teaching repertoire. In these learning contexts, she had no guarantee students would learn any of the biological content she thought necessary for the success of her lessons.

Being seen by her colleagues and students as a successful A-Level Biology teacher gave Teacher A her strong sense of personal identity. Since beginning her teaching career she had broadened her biological content knowledge and now had a deep understanding of the workings of the syllabus both of which continued to give her the intellectual stimulation she had come to enjoy over the years. A felt confident as a teacher, more in control of syllabus content than previously and as a result better able to gauge student progress:

> I have got more confidence ... they have all passed (laughs) ... well feedback and I suppose it is their enthusiasm and the quality of their work that they produce for homework that kind of thing. If they can't do the homework, which I have set because it is geared to the work that I have set in class and I will then think again about how I have taught the stuff ...

However, Teacher A often expressed a feeling of 'needing to be in control' as implied by her desire to be organised, to be prepared for the unexpected and to follow a lesson plan so that the student learning outcomes for each lesson were achieved:

> I can't cope (if not prepared), it has to go in the right place ... otherwise there is no point ... life is a diaster if you can't organise it (referring to the lesson resources).

Even though discussion and group work were stated by A as both educationally sound and valuable for students, they did not form a significant part of her classroom practice. This was evident in both her classroom talk to students and in her discourse about the use of controversial issues to teach biology, each of which will be addressed later in this paper. Indeed, formal planned discussions and group work did not sit comfortably with Teacher A - they made her feel professionally and personally uneasy and so were not part of her self image as a confident, successful A-Level Biology teacher. In these classroom situations she was unable to control the quantity and quality of the biological content students acquired and the manner in which this was learnt:

> I don't find it easy in discussion work unless I am really well prepared other than a quick chat. It does not come easy to me.

> Discussion is not something that I do, it is not something that I find easy, and it is not something that I thrive on.

Given both Teacher A's professional and personal concerns, achieving the goal of examination success meant that for her all lessons needed to be highly structured, teacher-centred and controlled. Such a highly structured teaching context, meant that A could manage her time efficiently, control the dialogue between students and herself and therefore not find herself in a situation where her content knowledge was questioned by students. Each of these aspects of her teaching could be seen in her talk about the usual manner in which she prepared her lessons. Asked to elaborate how this was undertaken, she replied:

> I prepare my lessons very thoroughly ... with OHTs (overhead transparencies) with the words that I am actually going to say, the words that are going to come out of my mouth and I have them written down. That is why I am not such a creative person.

It would appear that for this teacher, teaching and learning biology was best undertaken using whole class, lecture type instruction accompanied by preplanned, practical activities, that is, a traditional mode of whole class instruction. The following quotation, taken from an interview after the organ transplantation lesson, illustrates the tension she felt between the depth of content coverage and what she believed was the efficient delivery of syllabus content:

> You can't share everything at the end of the lesson, that's the only thing. At least that gives a good range ... I don't know I never know or am too sure what is the best thing to do there (referring to lesson changes). *I want everyone to know everything* (her emphasis) because it is such a shame if they don't if the opportunity is there. When it comes to structuring a lesson you might end up with a very bitty end.

In essence, what students received from her were 'solid, well researched facts' and stimulating lessons which were teacher-centred, well planned and implemented. From her perspective, this was the way in which she could legitimately and fully discharge her professional responsibility.

The second way in which Teacher A's professional concerns were manifested related to planned formal discussions and group work. For A each of these was problematic. Apart from the development of social skills, she was not convinced that whilst students were engaged in such activities they were learning anything of biological importance. In addition, she pointed out her own lack of confidence to use these teaching strategies for any sustained period of time:

> It (discussion) does not come easily to me ... I don't mind it coming up during the course of the lesson out of the blue but to initiate it is not something I have ever found easy.

Nevertheless, for educational reasons, discussion and group work remained aspects of teaching which A thought she ought to develop - "(they) enrich your teaching" and "it could make it sparkle". From her perspective, she tended to "pass the buck on things like that" to colleagues "who are very good on such matters".

A conception of learning and teaching A-level Biology, as the transmission of a body of factual information (from teacher to student), defined and determined by a syllabus, in a limited amount of time using an approach where lessons remained under her control and responsibility, gave this teacher her own self worth and professional status. Preparing and delivering lessons that were organised around syllabus demands meant that there was simply no time to engage students in learning activities which did not guarantee them the acquisition of a set amount of content, nor was there time to explore areas of biology outside immediate syllabus boundaries. Firmly locating her thinking and teaching within such perceived boundaries meant that Teacher A was able to maintain her professional reputation.

Propositional Theme 2: Views of Science/Biology

The following proposition concerns Teacher A's views of science/biology

On the one hand A indicated that biology was a collection of accumulated interlinking, immutable facts which students needed to acquire for examination success, whilst on the other hand, she saw biology as a form of knowledge where ideas, theories and experimental results were open to questioning and modification in the light of new evidence.

Three aspects concerning this proposition remained unclear - whether her views on the nature of science and that of biology were different, whether the views she chose to disclose during the study were part of a more inclusive view she might have of science/biology and finally, whether her epistemological view of science was different from that which she taught at school. Nevertheless, A did reveal that she read on a regular basis several professional journals both in science and in science education which for her meant she could avail herself of leading edge research. It was still difficult to ascertain the way in which such reading of this literature impacted on her current teaching practice. It would appear that the teaching constraints discussed in the previous propositional theme left her little time to fully utilise such resources and explore new modes of thinking about science and its teaching, a point endorsed by comments such as:

> ...depends if I am teaching the topic at the time ... that's always the acid test ... if I am teaching the topic at the time like I am now with the nervous system ... those happen to be in the papers ... that's brilliant ... I fetch them out and wave them about ... talk about them.

Distinguishing between this teacher's view of the biology/science taught in schools from that which engages scientists was difficult. What this experienced biology teacher seemed to indicate was that somehow science was an accumulated body of interlinking, content rich, factual information constructed and possibly controlled by scientists. For Teacher A, science was about "finding out and understanding about everything that is going on ... not creative because all the facts are out there, although there are new ones coming in ...". It could be that A had several ideas about the nature of science each of which were context dependent. Indeed much of her discourse both in interviews and in her observed lessons would indicate that the social aspect of science seldom featured in her lessons. That this teacher found new developments in biology/science of personal interest is not questioned. What is of interest is the extent to which she was able to incorporate these developments in biology/science into her teaching and so potentially give her a wider perspective on the mandatory content of the syllabus. It would appear that the use of controversial issues for example was not a significant component of her teaching practice, the rationale for which could be found in her conceptualisation of her teaching and through this her portrayal to students of biology/science as an accumulation of facts, something her students might well question.

Propositional Theme 3: A-Level Biology Students

Teacher A had two juxtaposed views of students - the first in relation to their academic ability and how she could foster their learning of biology and the second, in relation to students as social individuals who enjoyed classroom interactions.

On the one hand Teacher A seemed to think of students as mature, confident, articulate, generally academically and socially able, interested in controversial issues and debating, and possessing a fund of general knowledge, whilst on the other hand she seemed to think that they were often lacking basic biological knowledge. Furthermore, A seemed to believe that the more able students succeeded in achieving high A-Level Biology examination results despite her teaching while the less able students achieved passing grades because they undertook the required teacher directed tasks.

Maintaining her professional status could also be seen in this teacher's dialogue about students and their examination success. Her goals were that all students receive pass grades, the more academically able receive the high grades of A and B and that she continually drive her students towards such academic achievements. The latter from her perspective could be reached if all students were in possession of the required body of facts

and practical skills and that they link each of these into a conceptual map concordant with examinations. For this teacher, these goals were achieved by the more able students - "I am eternally grateful that those who are going to get the A's from the moment that they entered that group get A's and that one candidate who was a B got his B". However, for other students meeting the above criteria remained problematic "T failed and we did not enter her (for the examination), she had to enter herself because she was bone idle. She found it difficult as well". It was these perceived less able students who received most of her attention and so much of her teaching was undertaken in a transmissive mode of instruction. That some students chose not to follow her directions in terms of their learning was not a failure on her part. They had made an inappropriate choice. What she had done was to ensure that lessons were well planned and that what she asked of students either in class or for homework was all under her control and responsibility. Such a view of students as learners was in contrast with what she had come to expect of them as social individuals who enjoyed being in her lessons.

Given Teacher A's experience, she had come to the view that A-Level Biology students were for the most part a mixed social group: some were quiet, mature and tended to speak when they were certain of what they wanted to say, others were noisy and bright personalities, whilst others were willing to give an opinion on whatever topic might catch their interest. However, she was of the firm belief that students were not in possession of an adequate understanding of biology in order to discuss anything of a controversial biological nature. What they did know was obtained from the media. When it came to discussing a possible lesson on the pros and cons of organ transplantation, the comments below were not surprising:

> ... otherwise they are not going to know. I will have to tell them unless they have some information sheets. They have got to be fed that information don't they ... They will know nothing ... I may have made a miscarriage of justice here in saying that but unless they have seen something in the newspapers or on the TV I don't think anybody is terribly informed about it.

This teacher's hesitation in providing students with opportunities for sustained peer discussion had little bearing on whether they had the necessary social skills. Rather it was to do with students' perceived lack of mastery of content and the teacher's need to be in control of the acquisition of that information, as evidenced in the following remarks:

> The lecture type format, yes you try to break away from that by doing what I did last week when they had enough of hearing me talk. I split them into groups, small groups and gave them each a little bit to do, very , very precise tasks, one group who were not very good in ability just had to prepare a poster to show a cross section through a root to show the Casparian strip. Then they had to present it in the order that I needed it presenting and that was fine. But I still had to add my little bits as well. I am not then 100% about the understanding but at least I think that helped a little bit with the quality of the lesson. So that is something that I do. But they would happily have me lecturing all the time because it is easier, isn't it?

Such a view of students and their potential for independent learning persisted throughout the study.

Propositional Theme 4: Controversial Issues within A-Level Biology

Two propositions encapsulate Teacher A's thinking about the use of controversial issues, a thinking which marries closely with the discussion in the first propositional theme, her views of the A-Level Biology teaching context in which she worked.

Teacher A believed that controversial issues teaching was possible within her A-Level Biology teaching but only as one-off, short, distinct lesson activities the value of which lay within the domain of students' social skill development, not in terms of developing biological content knowledge and understanding.

Despite a willingness to invest her professional expertise into the planning and implementations of controversial issues lessons, acceptance of the possible usefulness of such issues to teach biological concepts remained difficult.

A sense of what A-Level Biology lessons meant for Teacher A and what her students experienced can be viewed by examining what she saw as the possibilities and problems for the teaching of controversial issues. From this teacher's position, the possibilities were in terms of developing students' social skills notably that of informed, mature, cooperative group discussion. In the reality of her day to day teaching, such issues were raised spontaneously by students or used by her to raise their interest for short periods of time and hence a divergence from what she had come to view as a content dense syllabus. Such issues were generally considered to be current and topical in the media but nevertheless transient. For each of these reasons, they were seen to have no significant place in teaching and therefore occurred as unplanned, unstructured, one-off events. The key point to be made here is that she believed little substantive biological understanding could be gleaned by students from such issues, an opinion coupled with her professional concerns and responsibilities, and identity as a successful teacher.

Furthermore, A had come to think of controversial issues as discrete topics most of which stood outside the syllabus proper. For this reason they were optional, might well compromise syllabus coverage and therefore had come to be regarded as bolt-on extras. Within the context of organ transplantation she remarked:

> ... it would be really very good if I could lead it up onto something else. I can't see that I can lead it onto something else, this particular one onto something else because I think they would think that it would be even better.

The possibility of extending students' awareness of some of the moral/ethical aspects of biology was the only other possible use for controversial issues - a possibility mentioned only in passing whilst the participant was reflecting upon students' reactions to the organ transplantation lesson:

> Well, I think it may have made them consider questions that they may never have considered in their lives, some of the questions in some of the folders. That is why they did so well ... watching them in their discussions because it was different ... they have to think this sort of thing through ... the morality.

Given this teacher's A-Level Biology teaching context, her beliefs about the nature of science/biology and how she had come to view her students as learners, using controversial issues other than for social skill development was problematic and therefore unrealistic. This position on controversial issues was entirely logical, consistent and rational.

Discussion

Many elements which contributed to Teacher A's professional and personal identity as a successful A-Level Biology teacher were identified in this study. Four emerged of prime importance and were helpful in coming to an understanding of the teaching context in which she worked. These were her perception of her biological content knowledge, her perception of her pedagogic skills in relation to A-Level Biology teaching, her views about the nature of science/biology and her perception of students.

Teacher A's perception of her biological content knowledge

This refers to the amount, adequacy and confidence this teacher had in her biological knowledge. It was portrayed throughout the study in her perceived need to 'mug up' before each lesson and in her detailed lesson preparation which often contained exactly what she would say to her students. The assertion here is that for this teacher confidence in the adequacy and amount of subject matter knowledge constrain and control classroom discourse. Presenting Teacher A with potentially unfamiliar content, as was the situation in this study, showed her hesitation in allowing students time to discuss, for example, controversial issues for any extended period. A situation not unlike that found by Carlsen (1992) in his work with teachers unfamiliar with topics. For Teacher A, her self image was maintained through avoidance.

In addition, it might well be that Teacher A found it difficult to transfer her knowledge base from familiar to unfamiliar contexts and thus in some way did not have the sophisticated, holistic conceptual understanding of biology needed to link the biology located both inside and outside the syllabus.

Teacher A's perception of her pedagogic skills in relation to A-Level Biology teaching

Teacher A had a clear rationale for her teaching practice. Her brief as teacher was to employ a set of finely tuned teaching approaches which in her view facilitated her own teaching and the learning of her students. It would appear that one particular teaching strategy, whole class instruction, was consistent with her perception of the influences of syllabus, time and examinations and her own level of confidence in what each strategy could contribute to students' learning of biological content.

Teacher A's perception of the nature of science/biology

Many writers have already mentioned the variety of views teachers have about the nature of science (Matthews, 1990; Koulaidis & Ogborn, 1995). For Teacher A science/biology was seen more in terms of accepted, value-neutral facts and concepts which scientists developed, textbooks stated and students needed to acquire (Gallagher, 1991). This was not to say she was unaware of the moral, ethical and social implications of scientific research. Rather these were viewed in terms of her civic/social responsibilities to students and to the larger community and therefore not part of her responsibility as a biology teacher. This would then explain why she articulated to her students her belief that they ought to carry donor cards for organ donation.

Teacher A's perception of students

For this teacher student learning was optimised when lessons were highly structured and routinised and where she was in control of all learning aspects. This was the teaching context in which A was most comfortable and thus became her preferred mode of operation. Even though students might be socially mature and confident, they were nevertheless lacking in an understanding of biology which she believed was essential for

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their academic success. In fact she believed students were incapable of constructing any biological understanding for themselves apart from any discussion as to how that knowledge base might be constructed. It was in her talk about students and their ability to engage with controversial issues that much of Teacher A's beliefs about her own teaching context were revealed.

Concluding Remarks

This study has actively sought out what it means to be a teacher of biology going about the normal day to day business of teaching using the discussion of controversial issues as a probe for this understanding. Even though the focus was on one teacher, much of what was articulated by her and subsequently analysed by the writer might well be true for other biology teachers. Perhaps further research will test the generalisability of these findings and ascertain the extent to which the real and perceived constraints of classroom teaching facilitate the incorporation of new/novel biological perspectives into classroom practice.

Bibliography

Bryman, A. and Burgess, R. G. (eds) (1994). Analysing qualitative data. London: Routledge.

Carlsen, W. (1992). Closing down the conversation : Discouraging student talk on unfamiliar science content. Journal of Classroom Interaction, 27 (2), 15-21.

Schutz, A. (1990). Collected papers (1); The problem of social reality. Dordrecht: Kluwer Academic Publishers.

Gallagher, J. (1991). Prospective and practising secondary school science teachers' knowledge and beliefs about the philosophy of science. Science Education, 75(10), 121-133.

Glaser, B. and Strauss, A. (1967). The discovery of grounded theory. Chicago: Aldine.

Hammersley, M. and Atkinson, P. (1983). Ethnography: Principles in practice. London : Tavistock.

Koulaidis, V. and Ogborn, J. (1995). Science teachers' philosophical assumptions: how well do we understand them?. International Journal of Science Education. 17 (3) 273-283.

Matthews, M. (1990) History, philosophy and science teaching: a rapprochement. Studies in Science Education, 18, 25-51.

Miles, M. B. and Huberman, A. M. (1994). Qualitative data analysis. Thousand Oaks: Sage Publications.

Van Rooy, W. (1997) Controversial issues and the teaching of A-Level Biology: Possibilities and Problems. Thesis submitted for the degree of Doctor of Philosophy at Oxford University.

Van Rooy, W. (1998) Addressing possible problems of validity and reliability in qualitative educational research. Paper presented at the annual Australian Association for Research in Education Adelaide conference, Australia.